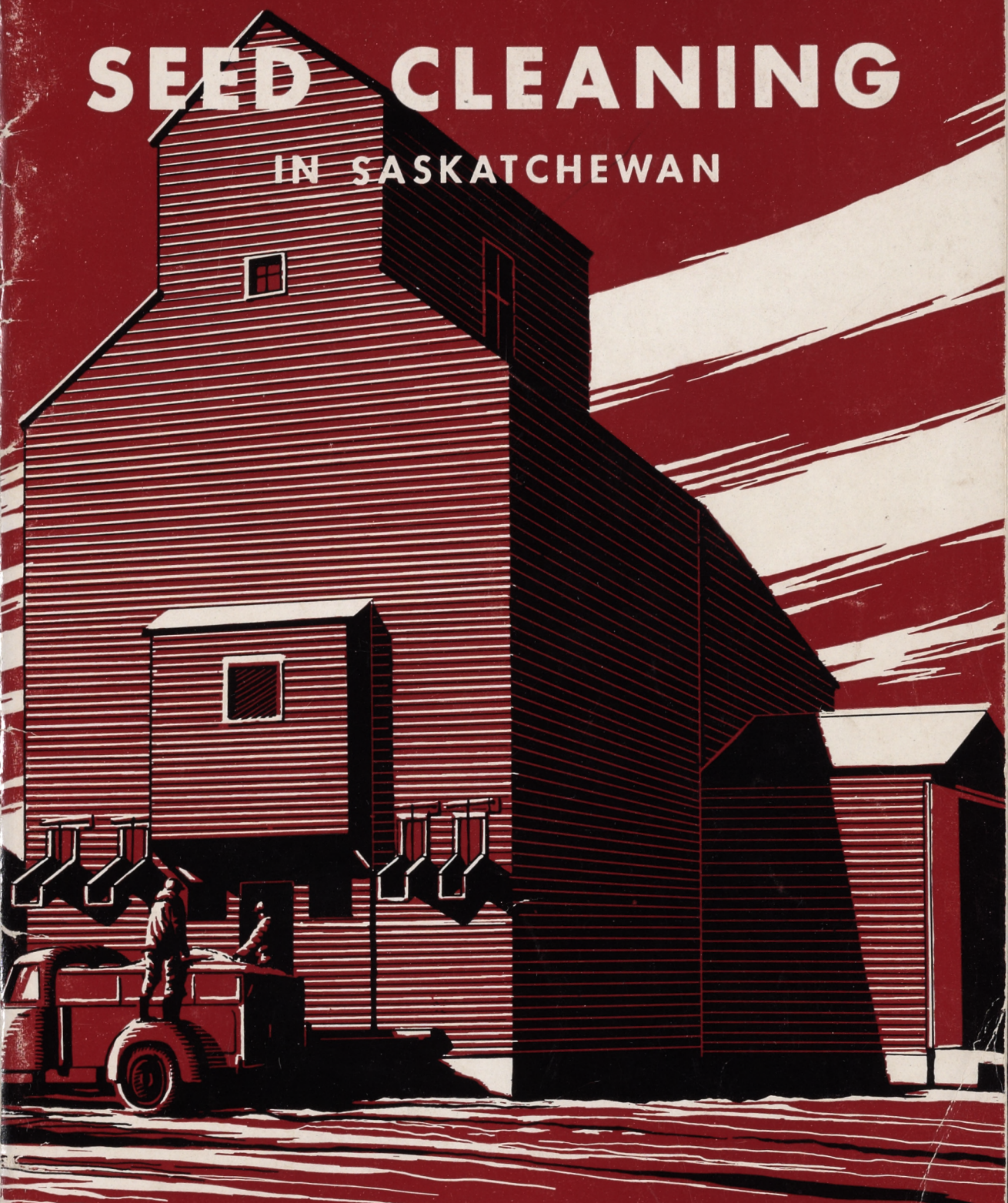


SEED CLEANING

IN SASKATCHEWAN



SASKATCHEWAN DEPARTMENT OF AGRICULTURE

AGRICULTURAL REPRESENTATIVE BRANCH

PUBLISHED UNDER THE SASKATCHEWAN CO-OPERATIVE AGRICULTURAL EXTENSION PROGRAM

BY AUTHORITY OF HON. I. C. NOLLET, MINISTER OF AGRICULTURE

1956



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Seed Cleaning In Saskatchewan

INTRODUCTION

In 1953, the Saskatchewan Department of Agriculture, with the co-operation of the Federal Department, made an extensive survey of seed grain quality. The Seed Grain Survey Report of 1953 stated, "The high incidence of rejected seed, the prevalence of elevator seed cleaning and the apparent lack of adequate cleaning plants emphasizes the need for a province-wide program for the establishment of better seed cleaning facilities". As a follow-up, this bulletin is offered to help those who wish to improve their seed cleaning facilities.

WHY CLEAN SEED?

It has been estimated that weeds cost prairie farmers \$255,000,000 annually which amounts to over \$1,000 per farm. Dockage losses, competition to crops, tillage costs and chemical control costs all contribute to the total.

This emphasizes the need for better seed cleaning facilities in our province.

HOW SEED CLEANING IS ACCOMPLISHED

In cleaning seed there are three distinct separations:

1. SCALPING

- (a) Separating straw and coarse materials from the grain.
- (b) Blowing out dust, chaff, etc.

This is usually done by wind, screens and sieves.

2. SCREENING

Removal of weed seeds, and small and broken kernels by sieves, screens, indent discs, cylinders, gravity and wind.

3. GRADING

Selection of seeds by size through the use of screens, discs, gravity and wind.

These separations are made by three basic differences in the seed grains and dockage, namely:

- (a) WIDTH, for example wheat and mustard.
- (b) LENGTH, for example wheat and wild oats.
- (c) WEIGHT, for example wheat and chaff.

Besides these, some specialized machines separate seed by using other differences, such as:

(d) **SURFACE TEXTURE** — rough surfaced seeds may be separated from smooth surfaced seed with fabric covered rolls, inclined moving belts, etc.

(e) **SHAPE** — flat seeds are separated from round seeds with a spiral gravity separator.

(f) **COLOUR** — seeds differing in colour are separated with the electric eye (large seed, special conditions).

The machines most commonly used are the wind and screen machines, indent disc and cylinder separators, gravity tables, gravity spiral separators and roll mills.

The following table shows the cleaning features of common machines. A plant needs to use the three main methods of separation to do a good job.

Machine	Separations Made by		
	LENGTH	WIDTH	WEIGHT
1. (a) Fanning mill (Std.)		V	V
(b) Corrugated roll attachment		V	V
2. Carter disc	V		
3. Indent cylinder	V		
4. Gravity			V
5. Width grader		V	

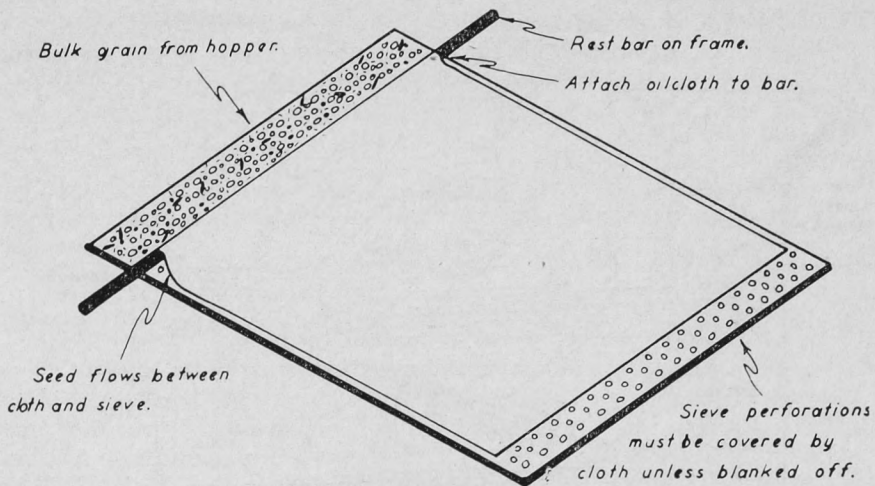
SEED CLEANING MACHINES

The Fanning Mill

This air and screen machine is used to first process practically all seed. It uses three cleaning elements; wind, scalping sieves and grading screens. The size varies from the two screen farm model to the industrial type machine.

Riddle—The top gang of sieves is called the riddle. This takes out coarse material such as straw while the grain and weed seeds fall through the sieves. The openings of the sieves should be just large enough to allow plump kernels to drop through.

Oil Cloth—Separation by length may also be made at the riddle by the use of oil cloth. An example is the removal of oats, both wild and tame, from wheat. Round hole sieves of 12/64", 13/64" or 14/64" diameter, depending on the size of wheat kernels, can be used. The oat kernels are too long to drop through these openings if kept flat on the screen by an oil cloth. The upper end of the oil cloth is fastened smooth side down to the lower side of one sieve and should lie flat on the sieve below. It may also be attached to a stick or bar at the upper end which is held slightly above the top sieve and the oil cloth draped over the top sieve.



Method of using oil cloth on sieves to hold down long seeds such as wild oats which tend to stand on end and drop through perforations.

Air Blast—As the grain falls from the riddle to the lower screen it passes through the air blast.

Special changes have to be made to some machines to get enough blast for good separation. Increasing the fan speed by using a smaller pulley on the fan shaft or by enlarging the openings at the ends of the fan housing will increase the blast. When speeding up the fan be sure to *not* speed up the whole mill or good grain may be thrown over.

A wind board is usually located just below the riddle. It is adjustable to direct the wind blast so good seed will not be blown out.

Usually this board should be set high with a strong blast rather than flat with the blast cut down. When the air blast is changed the position of the windboard should be checked.

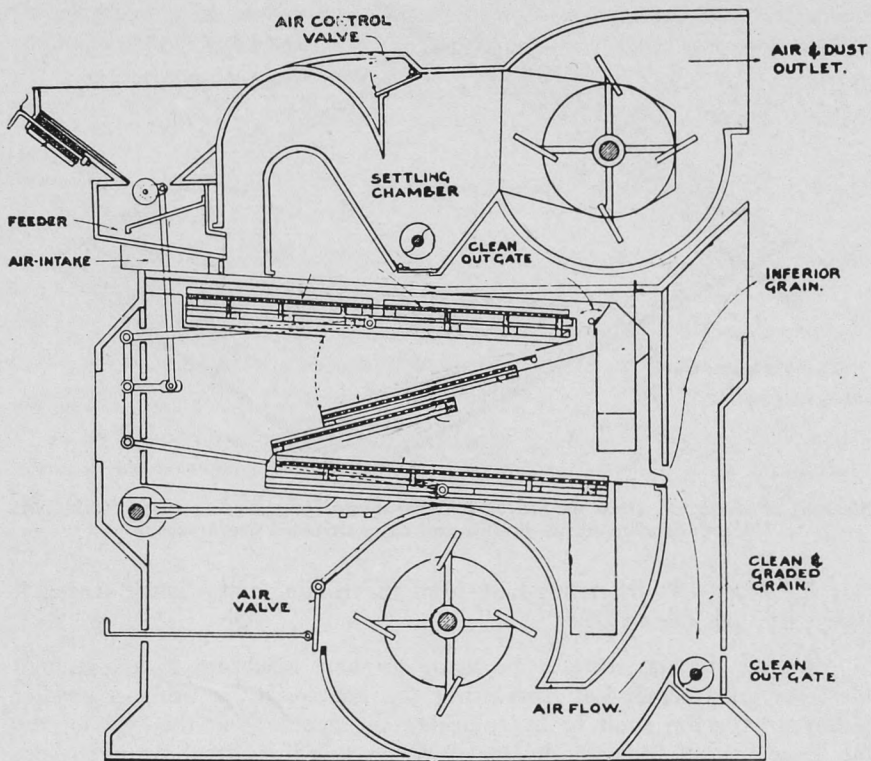
Aspiration—is the use of a fan for suction. Many larger fanning mills have an aspirator in addition to the usual blast fan.

Vertical Air Blast—Some fanning mills have a vertical air blast. These machines are usually more elaborate as they may be equipped with a double riddle, an aspirator, sieve and screen brushes and have a wide range of controls and adjustments. The blast goes straight up through the falling grain. A better separation by weight can be made with the vertical air blast than with the usual horizontal blast.

Lower Screen—The grain should flow thinly and evenly over the weed screen so weed seeds will have a chance to fall through.

Sieves and Screens—Sieves and screens are defined by the type of work they do. A sieve allows the good grain to fall through while a screen passes the good grain over the top. Sieves are usually in the riddle or top of the fanning mill and the screen at the bottom.

Size of openings should be plainly marked on the frames of sieves and screens. Sieves are usually made of zinc. When the openings are



Vertical Air Blast Fanning Mill.

round, the number refers to the diameter in 64ths of an inch. The lower screens may be zinc or woven wire. The openings may be round, square or oblong. The size for woven wire screens is indicated by the number of openings per inch, example—2x10 indicates two openings per inch one way and ten per inch the other way. Size of openings in some cases are indicated by fractions as $\frac{1}{10}$ ", $\frac{1}{12}$ ". Sieves and screens are easily damaged so they should be carefully stored. Fanning mills are measured by the width of the sieves in the riddle and will vary from 24" to 48" for farm size fanning mills.

Fanning Mill with Corrugated Rolls—Some fanning mills have corrugated screen rolls in place of the lower screen. The grain falls into the upper ends of the corrugated screen rolls which are set on a slope and are revolved. These rolls tumble the grain on end, allowing thin seeds to fall through while the seed grain is discharged at the lower end. Some separation of wild oats can be made from wheat and barley with these rolls. The speed of the rolls must be held at about 50 r.p.m. so the grain will tumble and not be carried around the roll by centrifugal force.

Operation—A fanning mill must be equipped with sieves and screens to suit the grain being cleaned. It should be operated steadily at the correct speed and fed at the rated capacity.

A generous selection of sieves and screens must be available. To select the proper sizes, place a sample of the material to be cleaned on the screen or sieve and shake it through. Repeat this operation until you are satisfied that you have the sieve or screen that will do the job you want.

Information on sieves and screens, as well as proper speeds and capacities, are given in the operator's manual which should be used for reference.

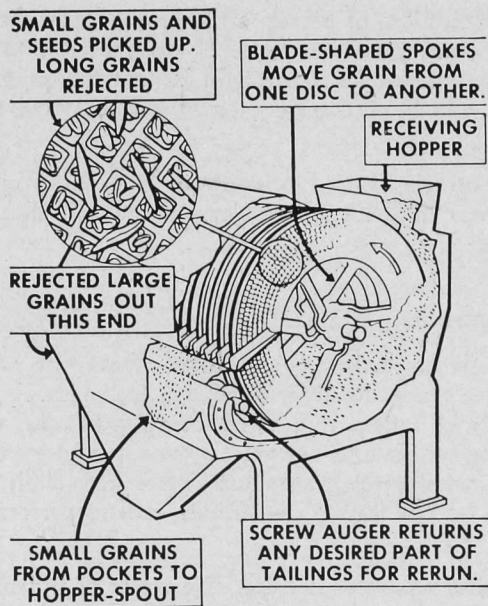
Carter Disc Separator

Different kinds of seeds are sometimes about the same width and cannot be separated except for their difference in length. A good separation can be made with an indent disc in removing wild oats, weed seeds and cracked grain from wheat and barley. To get satisfactory results from the small Carter disc machine the grain must be free from chaff, straw, etc. The grain should first be put through a fanning mill to perform the "scalping process".

The Carter disc separator consists of a series of indented discs which turn together on a horizontal shaft. Each disc contains hundreds of undercut pockets on each side. The pockets lift out the short seed and reject the longer seed. The long seeds are conveyed by the blades on the disc spokes to the end of the machine and discharged through the tailings opening.

The length of time the seeds are exposed to the cleaning action can be controlled by raising or lowering the tailings gate. Raising the tailings





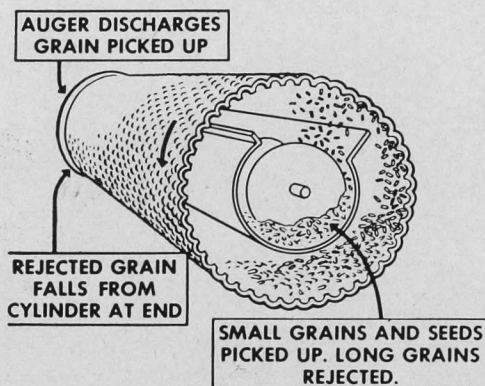
Carter Disc.

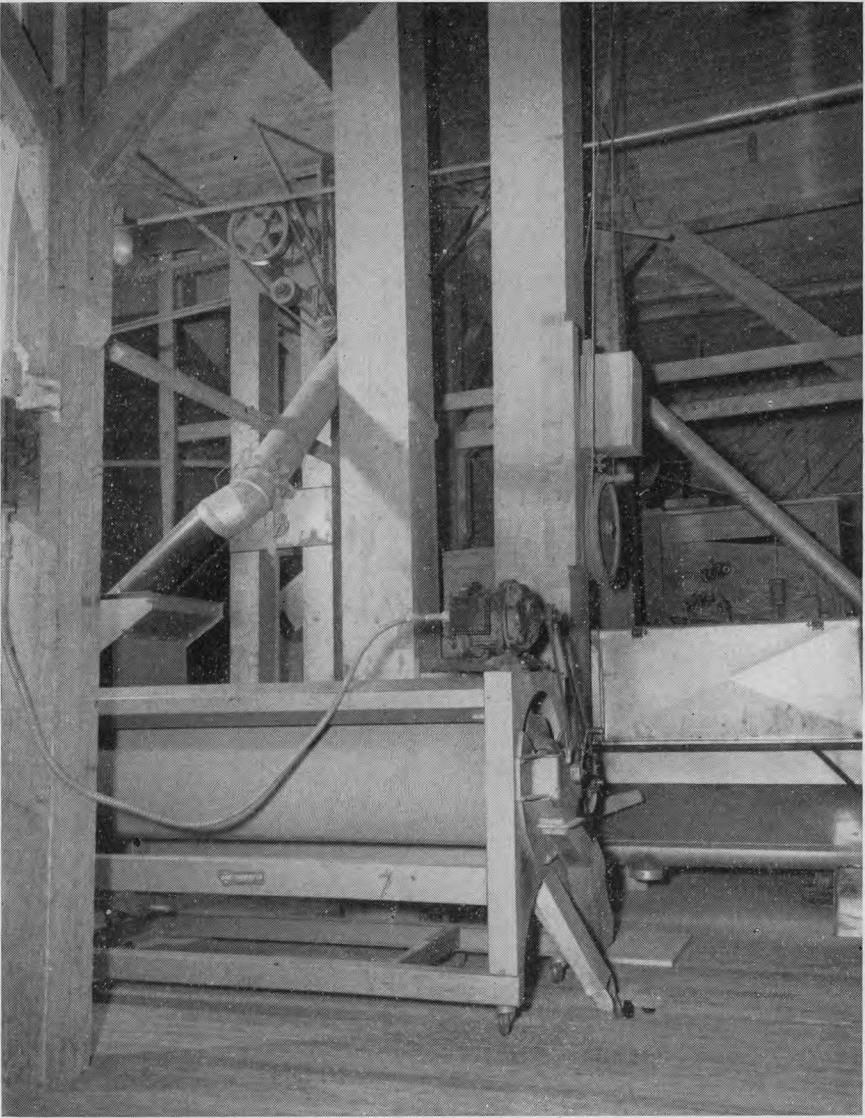
gate keeps the seed in the machine longer and gives the disc more time to clean the seed thoroughly.

The disc pockets vary in size from very small ones for cleaning clover to the larger ones for separating grains such as wheat and oats. The Carter disc separator can be used with all discs the same size or with a combination of different sizes.

Indent Cylinder Separator

This consists of a long cylinder with hundreds of half round indents lining the inside surface. Separation is made on the basis of the length of the seeds. As the cylinder turns, short seeds are lifted out of the mix-





Indent Cylinder.

ture by the indents and dropped into a trough inside the cylinder. The degree of separation is controlled by the position of the separating edge of the trough. If too long seeds are lifted out by the indents, the trough is set too low. If the trough is too high the short seeds picked up by the indents will fall back into the mixture and be discharged with the long seed at the end of the cylinder.

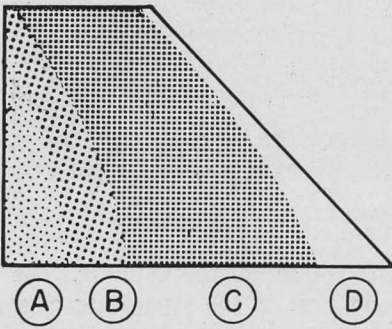
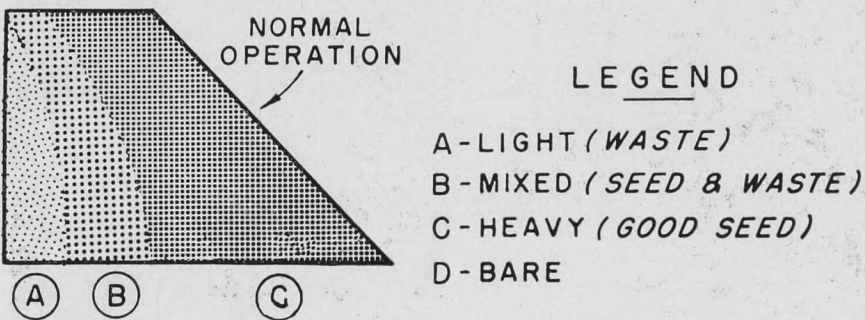
Some cylinder separators have variable speed drives. The desirable speed can be determined by setting the trough level and then adjusting the speed of the cylinder so the seed picked up by the indents will fall into the trough from the top of the cylinder. It is important that the cylinder be run at the correct speed. If too fast, the indents will pick up

some of the longer seed that should be rejected. If too slow the indents will reject some of the short seeds that should be lifted out.

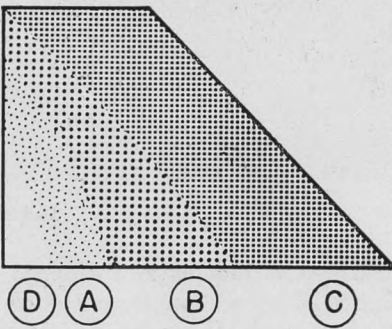
Cylinders with various size indents are available. They can be set up in units of two or more cylinders with different sized indents where more than one separation is to be made.

Specific Gravity Separator

This machine separates seeds by differences in their density. The seeds to be separated flow across an inclined reciprocating deck, usually of wire or cloth. The deck is mounted on incline toggles which give it two motions, an up and down motion and a backward and forward motion. The deck is covered with an open mesh material through which air is blown. The air blows the light seed to the top, and the heavier seed stays towards the bottom. The up and down motion pitches the seed up so it



TO CORRECT
DECREASE AIR
OR INCREASE SPEED
OR LOWER RIGHT END
OR LOWER BACK SIDE



TO CORRECT
INCREASE AIR
OR DECREASE SPEED
OR RAISE RIGHT END
OR RAISE BACK SIDE

Specific Gravity Deck.

is sorted quickly by the air blast. The backward and forward motion moves the heavier seed to the high side of the deck. If too much air is used the seed will not be in good contact with the deck and will not travel uphill. Particular use of this machine is for alfalfa and clovers.

Follow the instruction manual closely when operating or making adjustments.

Spiral Separator

This is a special machine used mainly for alfalfa and clovers, to separate flat seeds such as Russian Pigweed from the rounder alfalfa and clover seeds.

Blanket Separator

Wild oats have an awn or barb which causes it to stick to rough cloth. Where barbs have not broken off, wild oats may be separated from tame oats and other seeds with a "blanket" machine which may be equipped with a sieve scalper. Other units are termed as "carpet" machines which employ the same principle for making separation. Auger elevators may remove barbs from wild oats. This will reduce the degree of separation obtained by blanket and carpet machines.

SEED GRADING MACHINES

Seed grading is also part of seed preparation. To get the best stands and even germination, small, immature, broken and shrivelled seeds should be cleaned out.

GRADING BY WEIGHT

The vertical air blast fanning mill grades through its air blast. After leaving the screen the grain falls through a vertical air blast. The light seeds, chaff and many wild oats will be blown out.

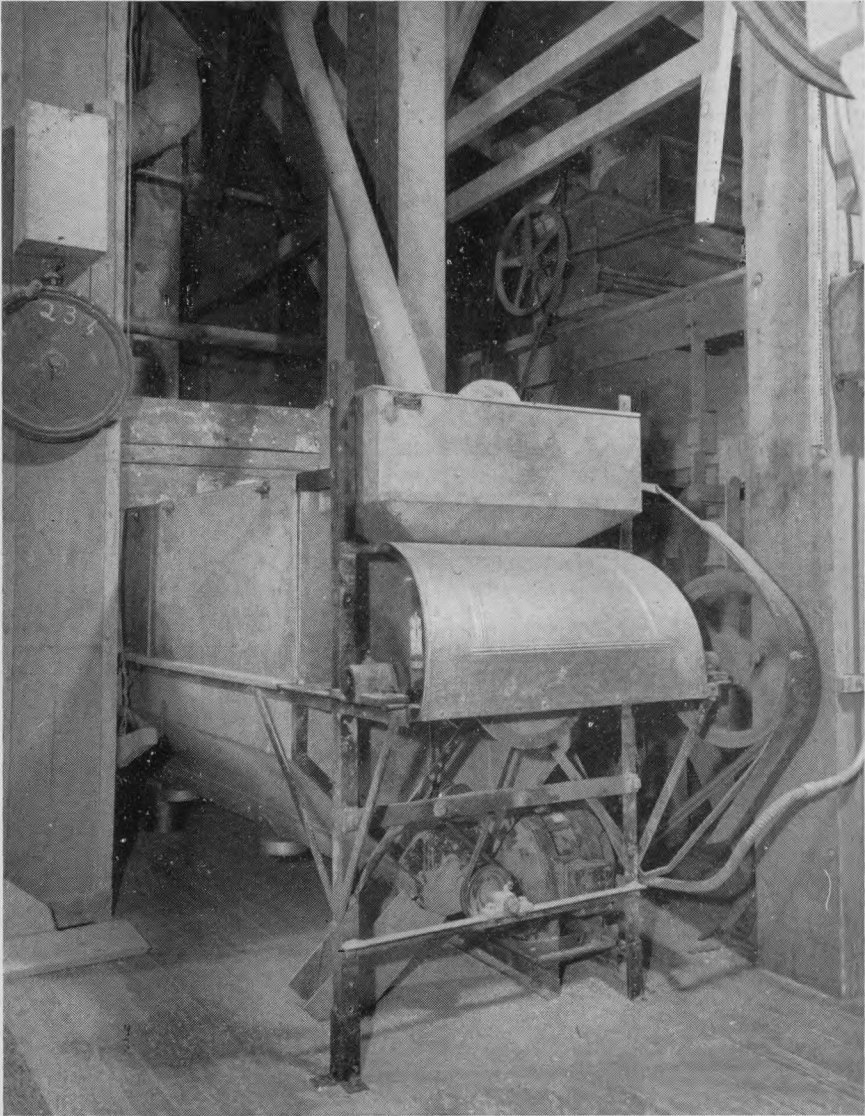
Grading by the vertical air blast may be regulated to make a very good separation by weight, provided the machine is operated at an absolutely uniform speed.

WIDTH GRADING

CORRUGATED ROLL GRADER—Corrugated wire rolls are quite efficient in separating thin oats from barley or wheat and a reasonably uniform sample of oats may result by grading out thin kernels. Rolls are available with a wide range of opening sizes.

WIRE CYLINDER—The grain should be free from straw and chaff before entering the wire cylinder if a satisfactory job is to be done. It may be cleaned first in a fanning mill or in a scalping attachment just ahead of the cylinder. Where the bulk grain is reasonably free of straw and chaff, the wire grader can be used to process grain before entering the wind and screen machine or indent machine. The wire cylinder machine separates by the width or thickness of the kernel. It consists of

a rotating cylinder made up of smooth wire wound accurately to a definite gauge upon bars, with spaces between the wires for the grain to drop through. The grain enters one end and travels to the other by means of an auger or by having a slope on the cylinder.



Wire Cylinder.

The cylinder may have the wire set at different spacing in different sections. The first section usually has the wire set with narrow spacing so only the weeds, small seeds and dockage will fall through. The next section is of a larger gauge, grading out the small grain and clean seed grain is delivered from the last section. The cylinder must be provided with a brush to keep the spaces between the wires clear. The efficiency

of the machine depends upon the speed at which the cylinder turns and the ability of the brush to prevent the kernels from sticking in between the wires.

PRECISION GRADER—This grader has a relatively new type of construction. It has cylinder shells of sheet metal with punched slots spiralled around the cylinder. A raised saddle divides the slots on the inside of the cylinder and turns the grain on end so it may fall through the slots. These saddles tend to move the larger grain to the discharge end due to the spiral.

Seeds that wedge in the slots are tapped out by revolving rubber blades which rotate against the outer surface of the cylinder. These



Precision Grader.

cylinders are available in single or multiple units and cylinder shells are available in a wide range of slot sizes.

GRADING BY LENGTH

The Carter disc separator may be used to grade up a sample of seed. Where this unit is used as a grader, the discs will be divided into sections, each with different sized disc pockets. Arranged in this manner, small seed may be removed and the larger, plumper kernels kept for seed.

SUMMARY

In cleaning our seed grain we should try to remove all dockage, especially weed seeds, as well as grade the seed by taking out shrunken, cracked or immature kernels leaving only large, uniform, healthy seeds. This process is not difficult or complicated but takes time. There is too often a tendency to try to speed up the operation and overcrowd the seed cleaning unit. Patience and careful adjustment will often make the difference between clean seed and dirty seed.

Selection of the proper size of sieves and screens, discs and combinations of machines is basic to a good job. Do not be afraid to stop your machine and try a different sieve or screen. Different grains, different varieties and even different samples of the same grain may require different treatment.

To get well-graded, clean seed it is often necessary to clean out a large percentage of the original sample. Clean-outs of 10 to 25 per cent or more, depending upon the sample should be expected. Heavy cleaning is necessary to get top quality seed.

Checking the Sample—To know the kind of job you are doing it is necessary to check the cleaned sample. This cannot be done by looking at a handful now and then. Take about a pound sample and spread it out on a clean board or table and look at it carefully to see how many weed seeds are getting through.

Operators of commercial or community plants should be familiar with seed grade standards and identity of weed seeds.

Agricultural representatives can advise how to get copies of identification booklets and grading standards.

After consulting the operators manual and several trials with the machines, if you cannot get the cleaning job you want, send a two-pound sample of the uncleaned grain to the manufacturer of the machine. The sample will be analyzed by them and the proper equipment for the machine will be recommended.

It must be realized that all separations cannot be made with any one machine, and two or more machines may be necessary to obtain a high quality sample of seed grain.

It must also be remembered that in seed cleaning as in harvesting not every kernel of good grain can be saved, nor can every piece of dockage be removed. *If nearly complete removal of undesirable seed or chaff is to be accomplished, some good quality seed will have to be lost.*

TYPES OF SEED CLEANING PLANTS

One type of seed cleaning plant would not be practical in all areas of the province. Therefore, it is not possible to recommend one single type, although preference is given to the larger central plants where practical; to carefully operated individual farm plants, and to the carefully operated, well constructed portable unit having facilities for thorough cleaning before moving from farm to farm. Those contemplating the construction of a plant will have to weigh the advantages and disadvantages of the type they are interested in constructing. *If it is to be a custom plant to service other farmers, the potential business should be surveyed to know whether the plant is practical in that area.*

1. Commercial Plants

(a) COMMERCIAL SEED HOUSES—These plants are equipped with elaborate and specialized machines for cleaning all types of seed, as well as for weighing, bagging and shipping. Purchase of graded seed from these seed houses can be recommended.

The sowing of Registered Seed, the seed with a pedigree, has the following advantages:

- (1) The highest quality seed you can buy.
- (2) True to variety.
- (3) Sound, well matured seed with high germination.
- (4) Free of prohibited and primary noxious weed seeds.
- (5) Relatively free of other weed seeds and impurities.
- (6) Produced from field inspected crops.
- (7) Cleaned and graded to Canada Seed Act standards.

(b) ELEVATORS—The Seed Grain Surveys have indicated that the standard of seed cleaned in public elevators operated by commercial grain companies has been very low. The grain cleaning equipment installed is primarily for scalping and dockage removal prior to shipping grain to terminals. In many cases, varieties are mixed and seed is contaminated with other types of weeds as well as plant diseases. This is due mostly to the difficulty of cleaning out the equipment between lots. The worst feature of cleaning in elevators is that new weed seeds can be rapidly spread through a district because of this difficulty of cleaning the equipment between lots. An example is tartary buckwheat.

The following would aid in obtaining a better standard of seed grain from elevators:

- (1) Sell the first fifty bushels of each lot of seed to the elevator.
- (2) IMPORTANT: Clean the equipment between individual lots of grain.
- (3) Clean entire lots at one time to prevent mixing.
- (4) Clean all of one kind of grain at a time or, if more than one elevator cleaner in the district, clean one kind of grain at each elevator.

(5) Arrange cleaning for periods of non-delivery (when the elevator is not taking grain).

(6) Encourage farmers to have grain cleaned well in advance of seeding so that facilities at the elevator are not rushed.

2. Large Stationary or Central Plants

(a) MUNICIPAL PLANTS—Some municipalities have constructed and operate large stationary seed cleaning plants for ratepayers. This type of plant, fully equipped and with approximately 10,000 bushel storage capacity, will cost about \$40,000 at the present time. They will serve an area included in a 15-20 mile radius of the plant or more than two municipalities.



Eston Seed Plant — R.M. No. 259.

The Seed Grain Survey has pointed out the high standard of seed grain cleaned in this type of plant and every encouragement should be given to constructing more of them. They offer better equipment and facilities than individual farmers can afford. Special equipment will be necessary in certain areas depending on the types of seed cleaned and the type of dockage. However, the equipment and service rendered will be essentially the same.

The peak period of cleaning tends to be after harvest and just before seeding. However, with co-operation of farmers, cleaning may be spread evenly throughout the year and permit the plant to clean in the range of 300,000 bushels in a year.

The manager is the key to successful operation of a central plant. He must be capable of keeping the equipment in good condition and properly adjusted, of obtaining co-operation of the patrons in timing delivery of their grain, and must also take charge of the accounting. He must be conscientious in cleaning machines after each lot. Where possible, the manager should arrange to clean all of one variety of grain in the district, then other varieties and kinds in succession. This reduces time spent in adjustments and changing equipment. A good telephone system in the district is a vital necessity in the efficiency of the plant. In addition to a full time manager another operator is necessary. Where a plant is operated 24 hours a day up to four men may be required.

Ratepayers are charged a fixed fee per bushel which is determined by the investment and operating costs of the plant. An additional charge of one cent per bushel is usually made on grain cleaned for non-ratepayers. In some cases cleaning is charged for by the hour but this practice is not common.

ADVANTAGES OF A CENTRAL CLEANING PLANT

(1) It is built for seed cleaning, can be cleaned between lots and does a good job of cleaning.

(2) A competent full-time manager is employed who becomes well versed in the multitude of problems which arise and can usually find a quick remedy.

(3) It can use special equipment which would otherwise not be available to the average farmer.

(4) A distribution and exchange point for seed grain. For this purpose the plant should be located on trackage.

DISADVANTAGES

(1) Investment is high and financing must be arranged.

(2) Distance and cost of hauling limits the amount of uncleaned grain which can be put through cleaner in order to obtain the desired quality of seed.

(3) Risk of mixing grains and introducing new weeds although if adequate facilities are installed for cleaning bins and equipment between lots and if the manager is careful this risk is minimized.

(4) Continuous operation of the plant may be affected by poor roads, example: rain, snow.

(5) An incompetent operator can do a lot of harm in a short time.

(b) **COMMUNITY PLANTS**—These may be similar to municipal plants only on a somewhat smaller scale. The cost of such a plant might vary from \$10,000 up. It may be constructed co-operatively by farmers in a community or by individuals who desire to provide a service to the community. It need not be elaborate but should have sufficient equipment to make most of the separations that would be necessary. Consideration must be given to the type of construction, equipment and location to best serve patrons. A central location linked with adequate roads is desired. A plant manager is necessary to ensure proper operation and efficiency. Minimum storage would be two bins for bulk grain and one bin for clean grain. Several bins for bulk and clean grain would be necessary for continuous operation. Equipment installed should be of sufficient capacity and arrangements should be made for efficient cleaning between lots of grain. Charges for cleaning can be agreed on by the investors to cover the investment and operating costs.

Advantages and disadvantages of a plant such as this will be similar to those for a municipal plant.

3. *Portable or Itinerant Plants*

Individual farmers and municipalities have both operated portable cleaning plants in the past. Where the operator has been very conscientious the results have been satisfactory but where operators are hired only in off seasons and are not entirely capable, this type of plant is not





Portable Seed Plant.

too satisfactory. This is mainly why municipal itinerant plants have not proven themselves. In some cases they have been doing a very good job.

Privately owned itinerant plants which have been well constructed and are operated by the owners as a business are providing a valuable service to those who otherwise would not have cleaning facilities available. Costs of a good portable unit will run in the range of \$10,000-\$15,000 including labour in construction. Capacity will range from 100 to 150 bushels per hour.

ADVANTAGES OF ITINERANT PLANTS

- (1) Provides equipment that otherwise is not available.
- (2) Farmers' costs are reduced. Hauling grain to central plants is eliminated.

DISADVANTAGES OF PORTABLE PLANTS

- (1) Weeds are spread widely if the unit is not adequately cleaned out before moving. Many of these plants have inadequate facilities for cleaning out the unit.
- (2) Time is wasted in moving from farm to farm.
- (3) Conditions of travel are sometimes impossible.
- (4) Bad weather may halt operations in the middle of a job.
- (5) In many cases, inefficient operators are employed who have a tendency to exceed the cleaning capacity.
- (6) Vibration of the plant.

SUGGESTIONS FOR IMPROVEMENT IN ITINERANT PLANTS

(1) Air compressor or vacuum installed to facilitate cleaning out the unit.

(2) Hoppers, elevators, floors and other parts holding grain should be lined with metal and the joints welded or soldered to facilitate cleaning.

(3) Elevators and augers should be constructed with handy cleanout doors.

(4) Levels should be carried on the machines and used at each setting of the cleaner.



Vacuum for Cleaning Between Lots.

4. Individual Farm Plants

In planning a farm seed cleaning plant, consideration should be given to the use of a permanent building to house the equipment. It may be one that is built especially for cleaning or may be a converted granary. Too often, seed cleaning machines are moved in and out of granaries and are not kept in good repair. A small permanent seed cleaner can be set up at a reasonable cost for machines, as low as \$300 to \$1,000, which will have a capacity of 30 to 70 bushels per hour. A wind and screen machine, a Carter disc or both with elevators, will do an efficient job if properly operated. If the equipment is not rushed, and there is no reason why it should be if the cleaning is done in slack seasons, seed can be cleaned to the seed grades.

A reasonably elaborate plant must be provided if a farmer is a Registered or Certified Seed grower as his seed must be graded. It is usual for these plants to have at least two types of cleaning machines, overhead hoppers, elevators, storage space and bagging facilities.

The farmer who cleans his own grain may get by with only one or two types of cleaning machines. He must be concerned with removing impurities which are found only on his own farm. To save labour he may have an overhead hopper feeding down through the cleaning machines with an elevator taking the clean grain into an adjoining bin. This can be done with a minimum of expense.

ADVANTAGES OF INDIVIDUAL FARM PLANTS

- (1) Cleaning facilities are available when desired, in slack periods.
- (2) Plenty of time available to get proper adjustments—if *the time is taken*.
- (3) Can arrange the time of cleaning to use extra labour that can be provided by neighbours.
- (4) No cost of hauling to a central plant.

DISADVANTAGES OF INDIVIDUAL FARM PLANTS

- (1) Expensive for the small farmer.
- (2) Individual farmers in many cases are not cleaning enough to be well versed with the adjustments.
- (3) Capacity of farm cleaners is low. Although this should not be a disadvantage the tendency is to exceed the capacity.

Custom Plant Capacities and Area Serviced

In surveying the potential business that a custom cleaning plant may be expected to receive, the following comparisons may aid in the selection of cleaning units for servicing various-sized areas:

9 Twp.—1 municipality

324 sections or farms	
207,360 acres	Approximately 150 bushels
210,000 bushels seed	per hour capacity plant
\$10,500 income at 5 cents per bushel	

4 Twp.—1 community around a town

144 sections or farms	
92,160 acres	60 to 75 bushels per hour plant
100,000 bushels seed	
\$5,000 income at 5 cents per bushel	

1 Twp.—Farm centered plants

36 sections or farms	
23,040 acres	30 to 50 bushels per hour plant
25,000 bushels seed	
\$1,250 income at 5 cents per bushel	

The amount of seed in each case is estimated at slightly over one bushel per acre on the total acreage of the area. Estimating that two bushels of wheat and coarse grains would be cleaned for each acre seeded this allows for summerfallow, uncultivated land and some who would not use the plant. Some farmers from outside the area would use the plant.

If individuals or groups are interested in providing a seed cleaning plant, a more accurate survey of customers should be taken to find if the plant will be feasible.

PLANT LAYOUTS

In providing sketches of seed cleaning plant layouts, a representative of several sizes and types are shown on the following pages. It is not suggested that a plant need be built exactly according to these sketches as there are nearly as many variations in plant layouts as there are plants in the province, so far as the arrangement of units is concerned.

These basic layouts incorporate many labour saving devices which should be given much consideration in constructing a plant regardless of size.

The use of electric motors, where power is available, will provide more satisfaction than other types of power although gas engines are very suitable. Electricity is more convenient in cold weather and provides steady, uniform power, which is necessary in seed cleaning. It will also prove more economical. It is recommended that separate motors be installed on each cleaning unit if possible.

Plan 1 — Individual Farm Seed Cleaning Plant

A small individual farm seed cleaning plant can be set up in a small inexpensive building, constructed especially for this purpose or in a building converted from some other purpose.

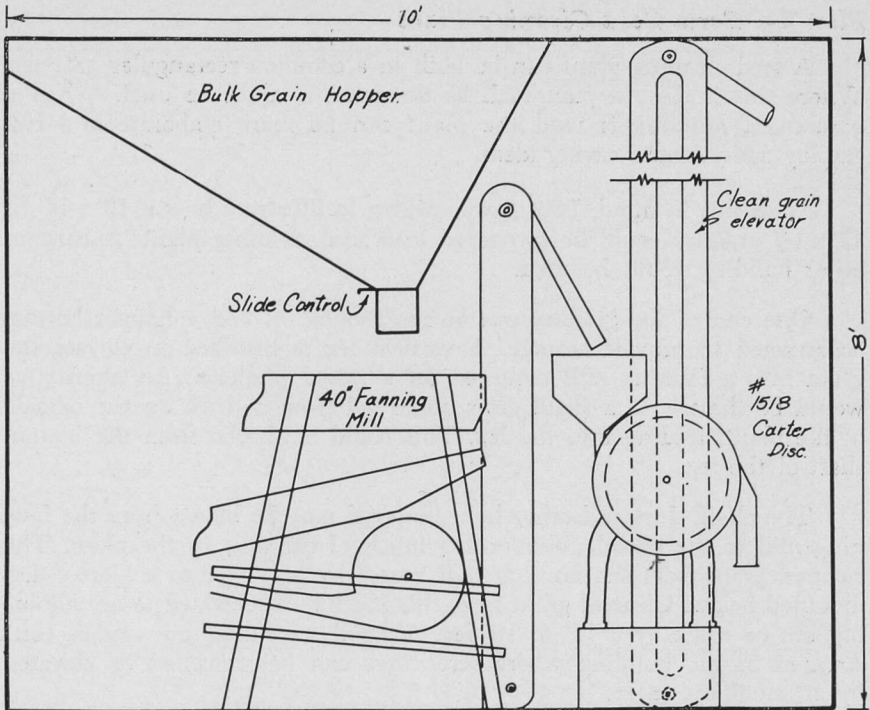
Plan No. 1 shows a layout recommended for the individual farm. The plant consists of a small building, size 8' x 10' which could be mounted on skids for portability in the farm yard. The machines consist of a 40" fanning mill at floor level fed from an overhead bulk grain hopper with a feed control. The hopper can be filled by a grain elevator through a small door in the gable end.

The fanning mill is equipped with an elevator which lifts the cleaned grain to the hopper on a No. 1518 Carter disc. The model number refers to the diameter and number of discs in the machine, example, there are 18 discs which are 15" in diameter. An elevator takes the clean grain from the Carter disc to an adjoining bin or truck.

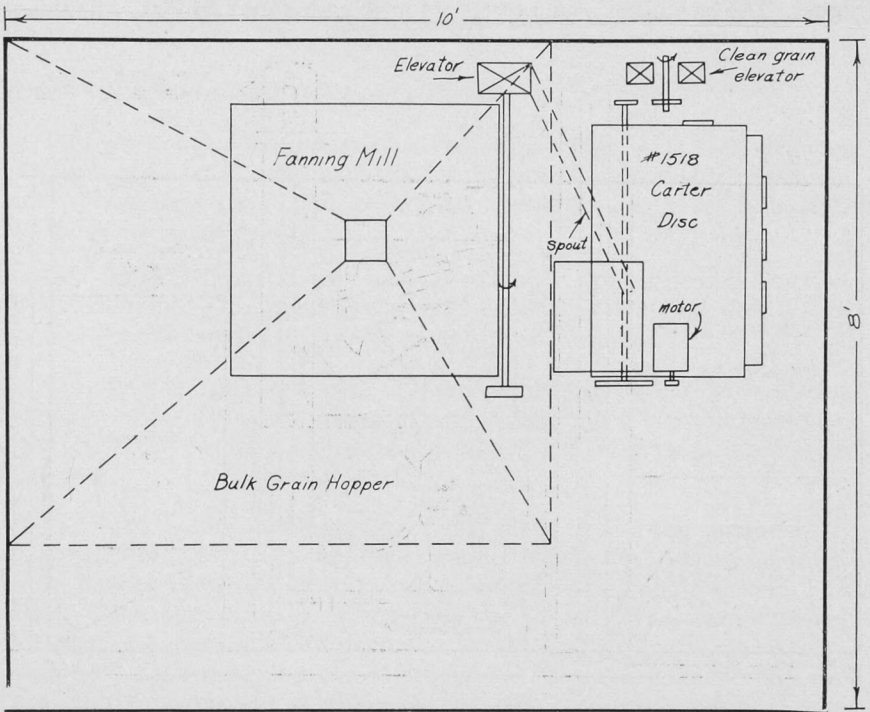
Where dockage is slight and the impurities are such that they can be removed with one unit this plant would serve that purpose. However, space should be available so an additional unit could be added in the future if desired.

In setting a fanning mill in any plant care should be taken to allow enough clearance from the wall so the efficiency of the fan will not be impaired. An enclosed outlet may be constructed to blow the chaff and dust outside.

The capacity of Plan No. 1 will be 50-70 bushels of wheat per hour and the cost of machines will approximate \$700.



Plan 1A — Cross section of a single or a double unit plant.



Plan 1B — Floor plan of a single or double unit plant.

Plan 2 — Farm Seed Cleaning Plant

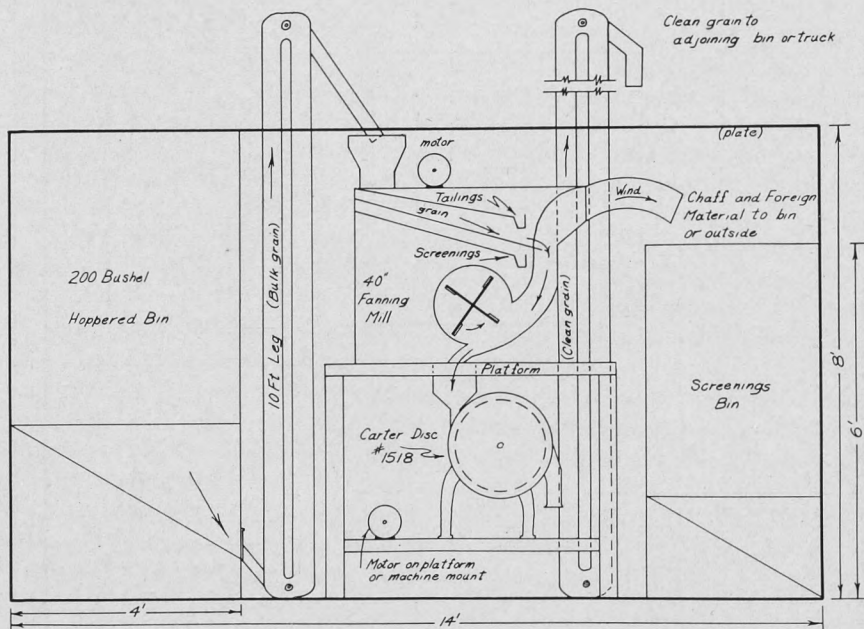
A seed cleaning plant can be built in a common rectangular granary. Where this is done a plan such as that shown could be used. When a permanent building is used the plant can be more elaborate and can employ many labour saving ideas.

With this in mind, Plan 2 was drawn to illustrate how a 10' x 14' or 12' x 14' granary could be converted to a seed cleaning plant. A barn or other building could be used.

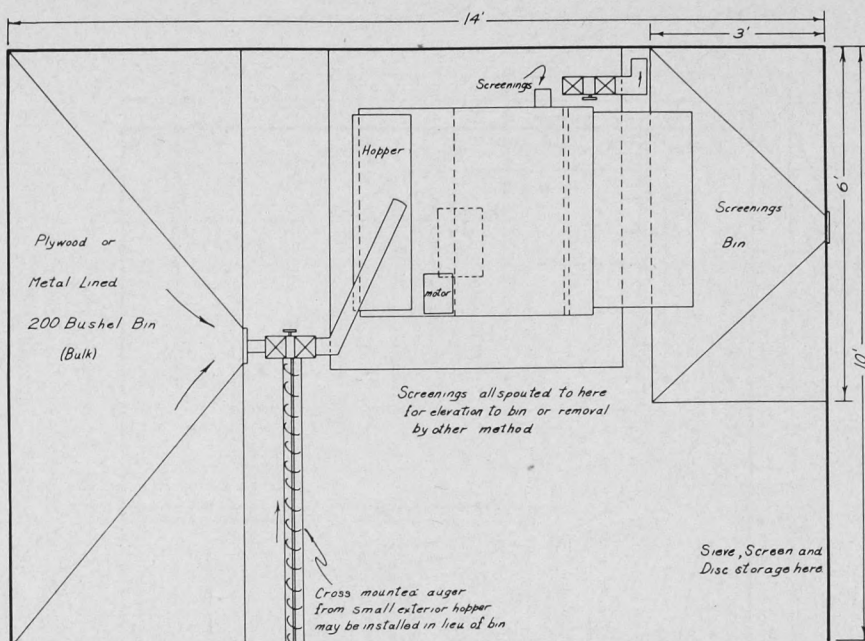
One end of the granary can be partitioned off and a hopper bottom constructed to provide storage. A vertical leg is installed to elevate the grain into a fanning mill mounted on a raised platform. An alternative would be the use of a small cross auger fed from a truck on the outside of the plant, feeding into the leg. This could be driven from the bottom shaft of the leg.

The chaff, dust and other light material may be blown from the fanning mill to the outside, eliminating much of the dust in the plant. The cleaned grain from the fanning mill passes by gravity into a Carter disc mounted below. Cleaned grain from this machine is elevated to an adjoining bin or truck by a 12' to 16' leg. A small screenings bin can be constructed in the building where screenings can be shovelled or elevated by an auxiliary auger.

Capacity of Plan 2 will be similar to Plan 1, ranging from 50-70 bushels of wheat per hour. However, the investment would be somewhat higher. The machines and accessories will cost about \$1,200. An indent



Plan 2A — Cross section of a double unit seed cleaning plant housed in a converted granary.



Plan 2B — Floor plan of a double unit seed cleaning plant housed in a converted granary.

cylinder may be substituted for the Carter disc although the latter will prove more versatile.

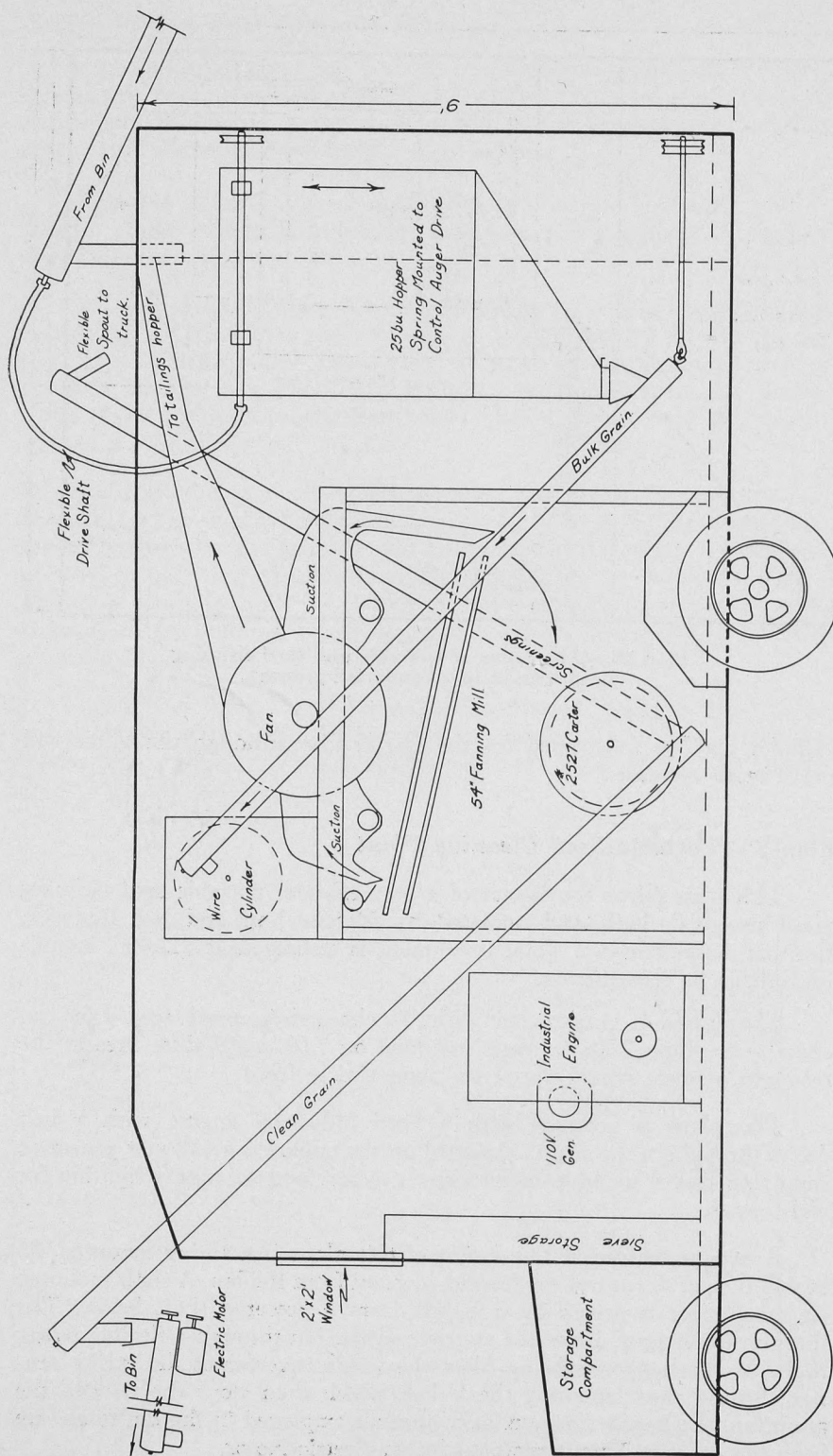
Plan 3 — Portable Seed Cleaning Plant

This plan shows the layout of a very efficient portable seed cleaning plant designed, built and operated by Messrs. Ken and Jim Renwick, Corinne, Saskatchewan. Total investment is estimated at \$12,000, including labour in construction.

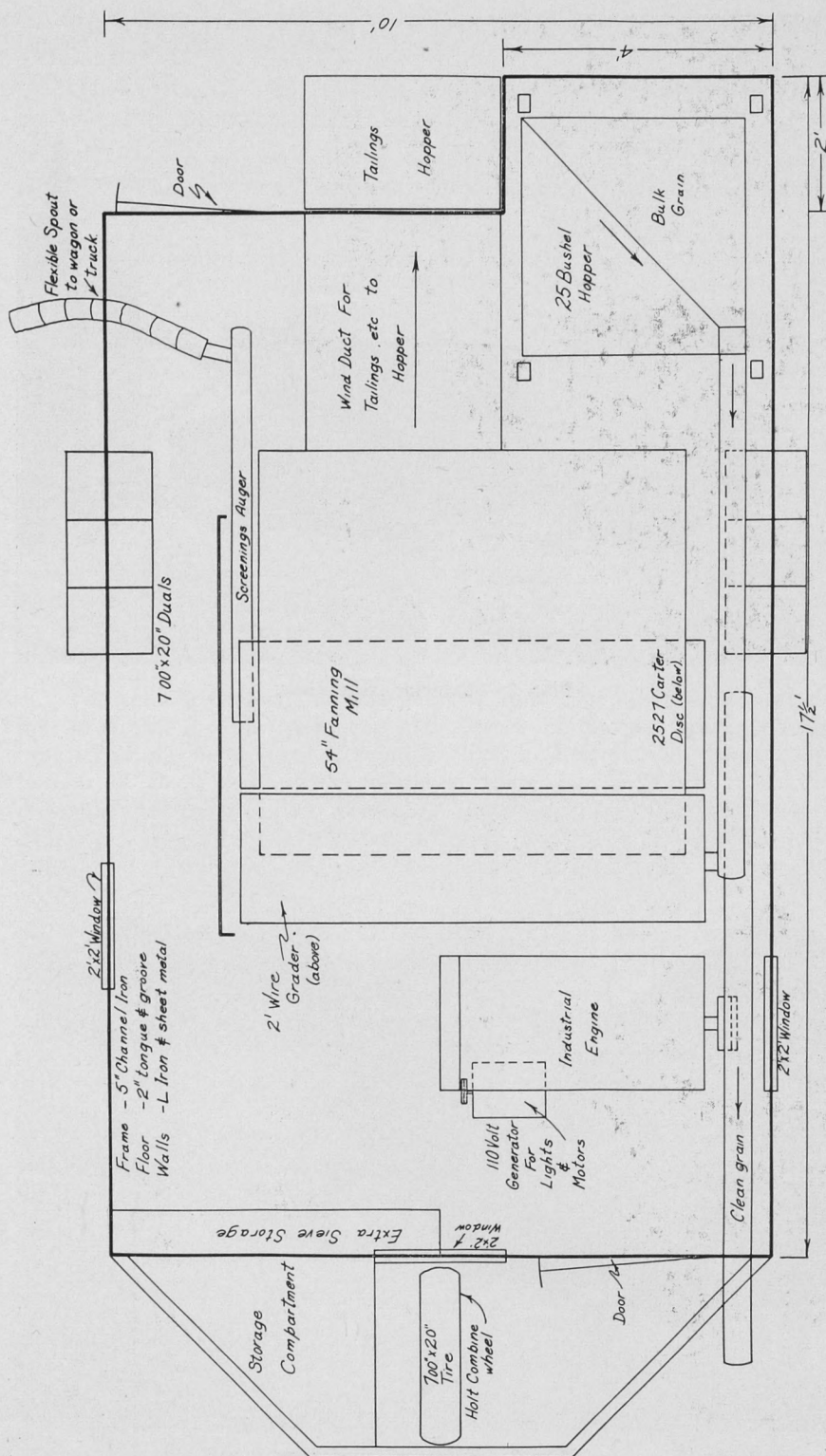
The frame is constructed with 5" channel iron salvaged from an obsolete combine. This frame is mounted on 7.00" x 20" dual tires at the rear and a single swivel tire of the same size in front.

The plant is powered with a Ford industrial engine with V-belt drives throughout the plant. Mounted on the engine is a 110 volt generator supplying power to drive motor driven augers and to supply lighting for night work.

A unique feature in the design of this plant is a spring mounted, 25 bushel hopper to control the feeding of grain from the bin. A shaft mounted on the hopper is driven by a V-belt from a powered shaft below. The shaft on the hopper drives the auger from the bin through a flexible power shaft. As the hopper is being filled the weight overcomes the spring tension, lowers, thus loosening the V-belt which then stops the flow of the grain into the hopper. An auxiliary auger is employed in the bin to elevate from the corners. This is powered by an electric motor.



Plan 3 — Cross section of Renwick Bros. portable seed cleaning plant.



Plan 3 — Floor plan of Renwick Bros. portable seed cleaning plant.



Plan 3 — Exterior, side view.



Plan 3 — Exterior, front view.

Grain from the hopper is elevated into a wire cylinder, passing through it to a 54" fanning mill and to a large Carter disc by gravity.

Dust, chaff and light materials are removed by the fan while screenings pass into an auger elevator to a truck or wagon outside.

Clean grain is removed from the Carter disc and elevated through an auger to another auger which is swivel mounted and delivers the grain to a bin.

Another device which is being used by the operators of this plant is a circular, nine-foot diameter, eight-foot high open top portable bin. This bin is positioned near the cleaner when an empty bin for clean grain is not available. The clean grain is elevated into this bin and when the bin of bulk grain has been cleaned the portable bin is emptied back into the original one.

Capacity of this plant is 100-150 bushels of wheat per hour.

Plan 4

A stationary community plant was designed and built in 1955 at Kindersley by John K. Jackson. This type of plant could be recommended for many areas in the province and details are given on the following pages.

The total investment in this plant is approximately \$30,000 including an annex for the treatment and storage of cleaned grain. Storage capacity of the main plant is roughly 5,000 bushels of bulk grain, 3,000 bushels of clean grain with additional space for screenings. Cleaning units installed in this plant include a Clipper Fanning Mill, Model Super 298D; a Carter Precision Grader (slotted cylinder) and a Carter Disc unit. When processing grain as Durum wheat, an indent cylinder replaces the Carter disc.

Capacities of this plant for cleaning wheat are: 180 bushels per hour; flax 60-70 bushels per hour and other grains 150-170 bushels per hour.

Cleaning charges are: Wheat—	4½ cents per bushel
Flax—	10 cents per bushel
Other grains—	5 cents per bushel

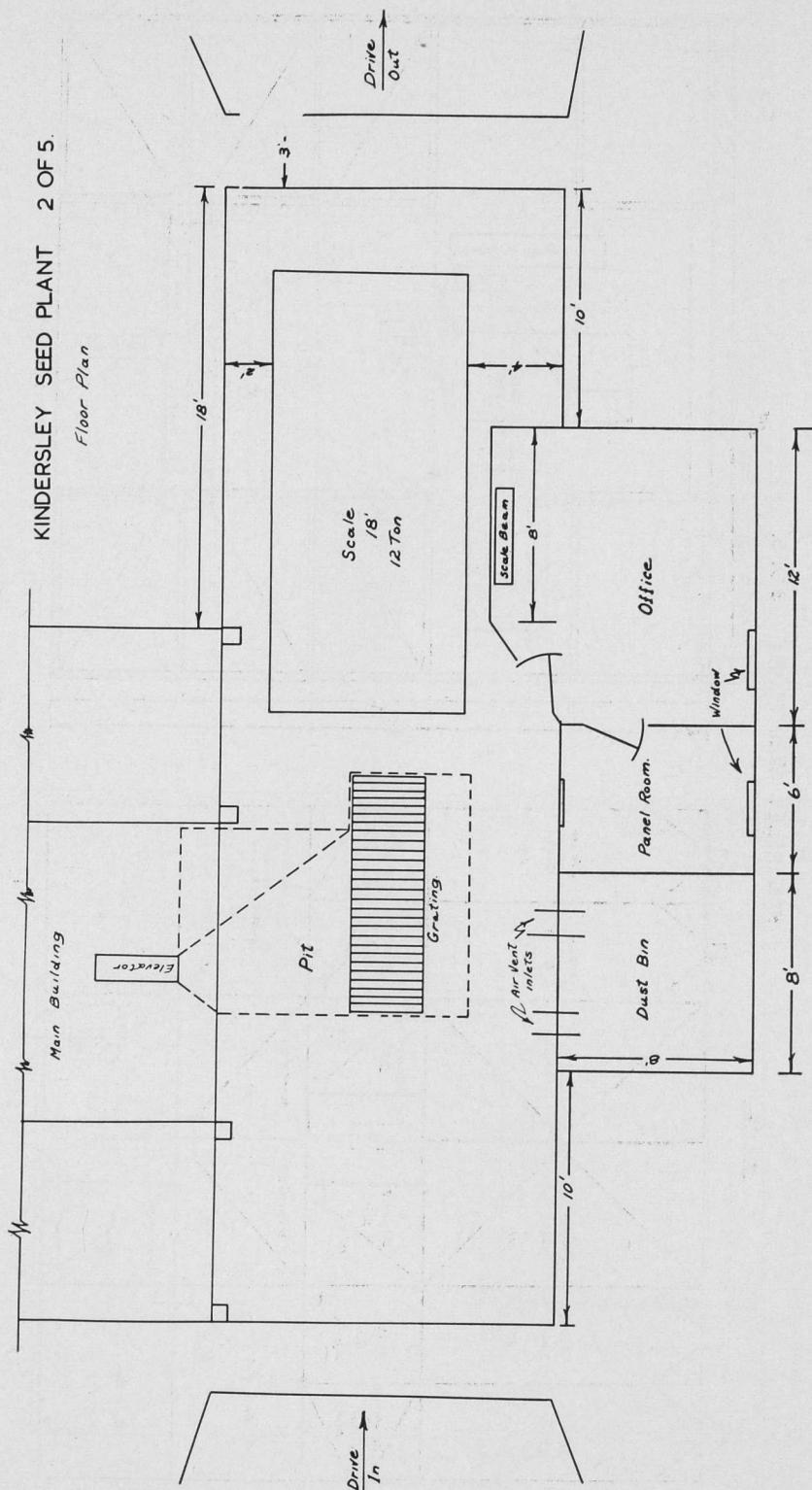
A detailed description cannot be given in a bulletin such as this. However the following drawings and photographs will help to explain the construction and layout details.

Foundation and Footings.



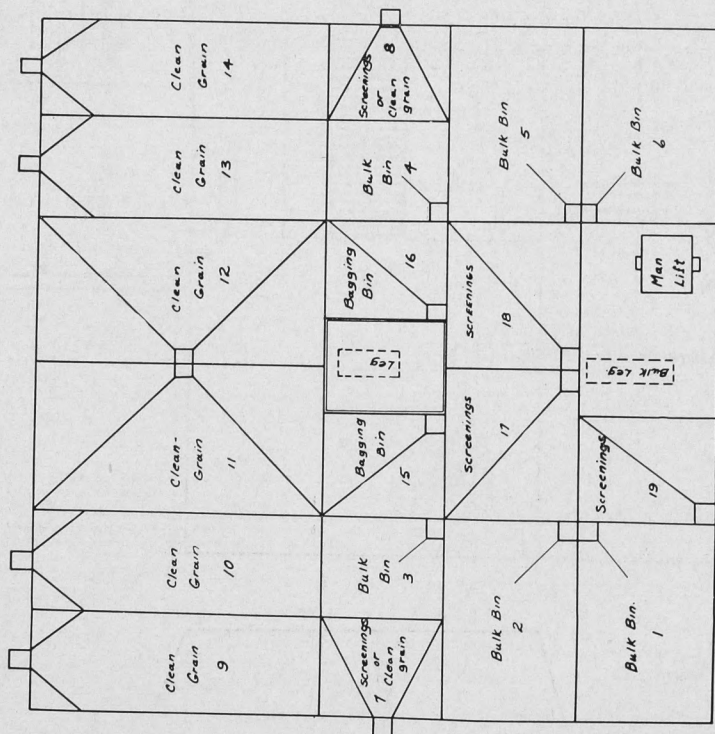
KINDERSLEY SEED PLANT 2 OF 5.

Floor Plan

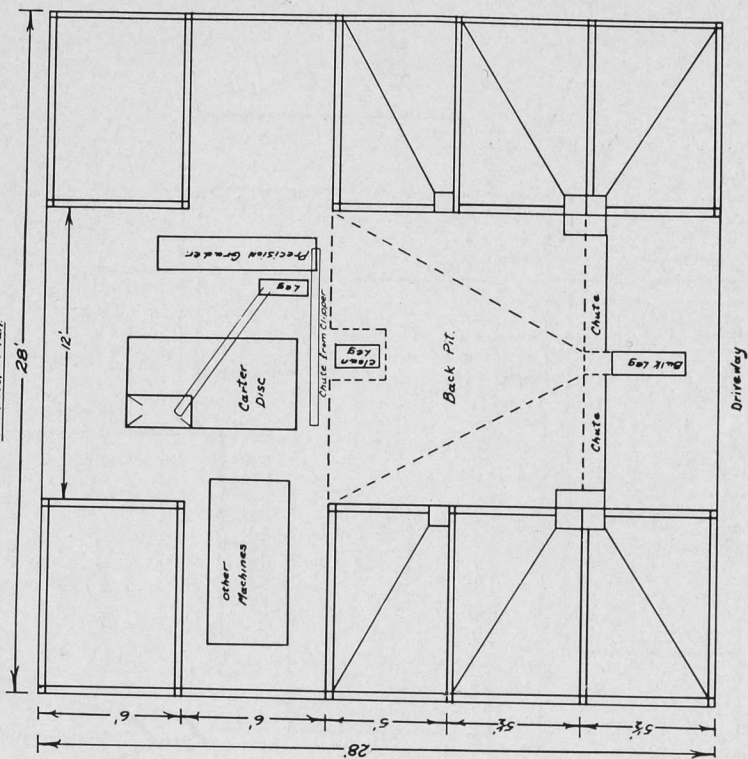


KINDERSLEY SEED PLANT 3 OF 5.

Bin Plan



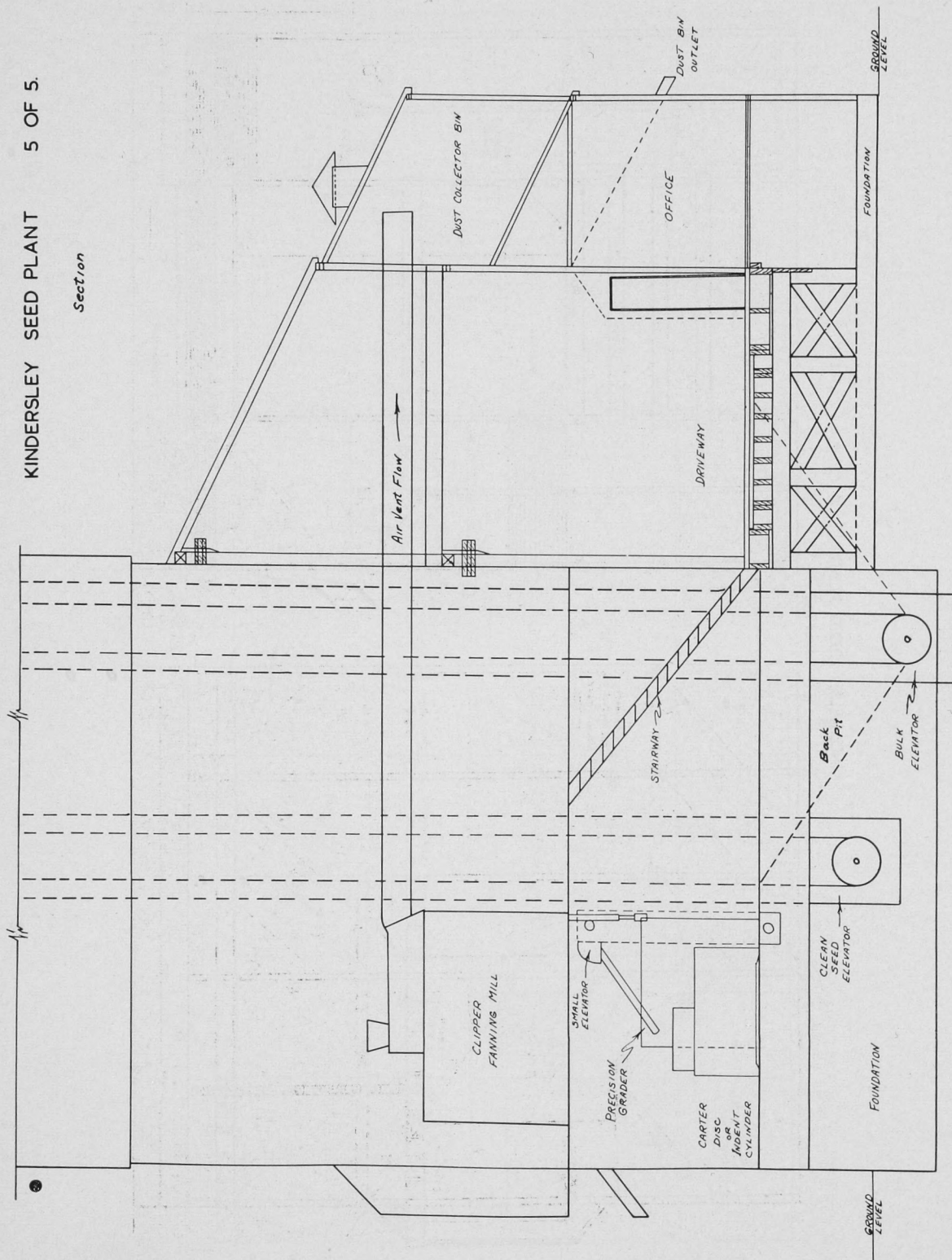
1st Floor Plan



Sections



Section





Exterior view of J. K. Jackson seed plant at Kindersley.



Main Floor Cleaning Units, J. K. Jackson Seed Plant.

SEED CLEANING CO-OPERATIVES

Because good seed cleaning equipment is costly many farmer neighbours get together and jointly purchase seed cleaning equipment. In some cases, this arrangement works out fairly well; in others, problems have led to a breakdown of the arrangement.

Co-operative Organization—Whenever a group of people are considering working together to provide themselves with a service they should organize on a legal business basis. The Co-operative Associations Act is designed to meet the needs of this type of group. Incorporation under the Act provides a legal organization that can enter into contracts, borrow money either from members or outside sources, hold title to property, etc. It also provides for limited liability of the members, that is, their liability is limited to their investment in the co-operative plus any amount unpaid on shares.

The Extension Services Division, Department of Co-operation, provides a field staff that is available to provide information and to assist with incorporation, bookkeeping, management problems, membership relations, etc. This service will be made available to you by writing to the Extension Services Division, Department of Co-operation, Regina, or by contacting one of the fieldmen.

APPENDIX

TABLE 1 — CARTER DISC SIZES AND THEIR USES
(In Order of Size from Smallest to Largest)

V-4	For lifting weed seeds out of flax. Very small (Pigweed) Lady Thumbs.
V-5	Weed seed disc for lifting the small weed seeds out of wheat. Mustard and seed bigger than Pigweed.
V-5 1/2	Slightly larger than V-5, will pick out weed seeds a bit larger than in V-5.
V-6	Seeds out of exceptionally large flax.
Q	Weed seed disc. Not used much in Carters.
N	Standard weed discs for picking out all standard weed seeds including buckwheat and that size.
NJ	Splitting Disc—"N" on one side, "J" on the other side.
K	For picking flax out of wheat and any extra large weed seeds that "N" cannot handle (flax).
C	For lifting small wheat.
EE or RE	Standard wheat disc for average wheat. Spring wheat.
Standard J	Wheat discs for extra large standard wheat.
A	Commonly used for Durum, small barley and large Selkirk wheat.
B	Straight barley disc.

TABLE 2 — SINGLE ROLL CARTER DISC SET-UPS
(Starting at Feed End of Machine)

SET-UP OF DISCS	DISCS REQUIRED
Standard combination wheat set-up (Selkirk)	4-V5, 4-N, 1-NJ, 7-J, 2-A, all 1"
Straight wheat set-up	4-J-2 1/4", 11-J-1", 3-A-1"
Standard combination durum set-up	5-N, 4-C, 9-A, all 1"
Standard combination barley set-up	5-N, 4-EE, 9-B, all 1"
Straight barley set-up	4-B-2 1/4", 14-B-1"
Special flax set-up (6 to 7 bushels per hour)	9-V4, 7-K, 2-C, all 1"

TABLE 3 — DOUBLE ROLL CARTER DISC SET-UPS
(Starting at Feed End of Machine)

STYLE ZW-1	ROTOR	DISCS REQUIRED
Standard Combination Wheat Set-up (Selkirk)	TOP	4-J-2 1/4, 11-J-1", 3-A-1"
	BOTTOM	5-V5, 4-V5 1/2, 10-N, 2-K, all 2 1/4"
Standard Combination Durum Set-up	TOP	4-A-2 1/4", 12-A-1", 2-B-1"
	BOTTOM	5-V5, 10-N, 6-C, all 2 1/4"
Standard Barley Set-up	TOP	4-B-2 1/4, 14-B-1"
	BOTTOM	4-V5 1/2, 10-N, 2-K, 5-J, all 2 1/4"
Flax Set-up (one rotor only)	TOP	Use any discs that will lift flax. Separation to be made in lower rotor.
Submit sample to Winnipeg	BOTTOM	9-V4, 10-K, 2-C, all 2 1/4"
Flax Set-up (both rotors)	TOP	4-K-2 1/4", 14-K-1"
	BOTTOM	18-V4, 3-V4 1/2, all 2 1/4"

TABLE 4—SIEVE AND SCREEN SIZES FOR CEREAL GRAINS

Kind of Seed	TOP SIEVES (Riddle)			LOWER SCREEN		
	Kind	Shape of Opening	Size	Kind	Shape of Opening	Size
Wheat	Zinc	Round	12/64", 13/64", 14/64"	Zinc	Round	7/64", 8/64", 9/64"
				Zinc	Oblong	4/64 x 1/2", 1/14 x 1/2", 5/64 x 1/2", 7 x 7", 8 x 8", 9 x 9"
				Wire	Square	7 x 7", 8 x 8", 9 x 9"
				Wire	Oblong	2 x 9", 2 x 10", 2 x 11"
				Zinc	Triangle	8/64, 9/64 buckwheat
Wheat (Durum)	Zinc	Round	14/64", 16/64"	Zinc	Round	9/64", 10/64"
Oats	Zinc	Oblong	8/64 x 3/4" to 11/64 x 3/4"	Zinc	Oblong	5/64 x 1/2", 5/64 x 3/4", 1/12 x 1/4"
	Wire	Oblong	1/2 x 5", 3/4 x 5", 3/4 x 6"	Wire	Oblong	2 x 10", 2 x 11"
Barley	Zinc	Oblong	8/64 x 3/4", 10/64 x 3/4"	Zinc	Oblong	5/64 x 3/4", 6/64 x 3/4"
	Zinc	Oblong	6/64 x 5/8"	Wire	Oblong	2 x 9", 2 x 10"
	Zinc	Round	14/64" to 18/64"	Wire	Square	8 x 8"
Flax	Zinc	Round	7/64"	Zinc	Round	5/64"
	Zinc	Oblong	4/64 x 1/2", 4/64 x 1/4"	Zinc	Oblong	1/12 x 1/14"
	Wire	Oblong	3 x 16", 4 x 16", 3 x 14", 4 x 14"	Wire	Square	13 x 13", 14 x 14"
Rye	Zinc	Round	9/64" to 12/64"	Zinc	Round	6/64"
	Zinc	Oblong	8/64 x 3/4"	Zinc	Triangle	9/64"
				Zinc	Oblong	1/12 x 1/14"
Peas (small)	Zinc	Round	20/64"	Wire	Square	11 x 11"
				Zinc	Round	8/64"

TABLE 5 — SIEVE AND SCREEN SIZES FOR FORAGE SEEDS

Kind of Seed	TOP SIEVE			BOTTOM SIEVE		
	Kind	Shape of Opening	Size	Kind	Shape of Opening	Size
Alfalfa.....	Zinc	Round	1/14"	Zinc	Round	1/18"
Alfalfa.....	Zinc	Round	1/12"	Zinc	Round	1/20"
Alfalfa.....	Wire	Square	14 x 14"	Zinc	Round	1/22"
Alfalfa.....	Wire	Square	16 x 16"	Zinc	Round	1/25"
				Wire	Square	20 x 20"
Sweet Clover.....	Same as	for Alfalfa				
Brome Grass.....	Zinc	Oblong	1/12 x 1/2"	Zinc	Round	1/12"
Brome Grass.....	Zinc	Oblong	5/64 x 1/2"	Zinc	Round	5/64"
Western Rye Grass.....	Zinc	Oblong	4/64 x 1/4"	Zinc	Round	1/14"
				Zinc	Round	1/16"
Timothy.....	Zinc	Round	1/20"	Wire	Square	28 x 28"
Timothy.....	Zinc	Round	1/22"	Wire	Square	30 x 30"
Timothy.....	Wire	Square	22 x 22"			
Siberian Millet.....	Zinc	Round	1/14"	Zinc	Oblong	3/64 x 5/16"
Common Millet.....	Zinc	Round	1/15"	Zinc	Round	1/18"
Foxtail type)....	Wire	Oblong	3 x 16"	Zinc	Round	1/17"
	Wire	Square	12 x 12"	Wire	Square	14 x 14"
				Wire	Square	16 x 16"
Millet (Proso).....	Zinc	Round	6/64"	Zinc	Round	1/12"
Early Fortune.....	Zinc	Round	1/11"	Zinc	Oblong	1/18 x 1/4"
(Broomcorn type).....	Zinc	Oblong	1/13 x 1/2"	Wire	Oblong	3 x 18"
	Wire	Square	(10 x 10")			
	Wire	Square	(9 x 9")	Wire	Square	14 x 14"
Crested Wheat Grass.....	Zinc	Oblong	1/4 x 1/14"	Zinc	Round	1/16"
	Zinc	Oblong	1/4 x 1/13"	Zinc	Round	1/17"
	Zinc	Oblong	1/4 x 1/12"	Zinc	Round	1/18"
	Zinc	Oblong	1/4 x 1/18"	Zinc	Round	1/24"
	Zinc	Oblong	1/4 x 3/64"	Zinc	Round	3/64"
	Zinc	Oblong	1/4 x 4/64"	Wire	Oblong	2 x 18"
	Zinc	Oblong	1/2 x 3/64"	Wire	Oblong	3 x 18"
	Zinc	Oblong	1/2 x 4/64"	Wire	Oblong	2 1/2 x 16"
				Wire	Oblong	3 x 16"

TABLE 6 — SPEED SETTINGS OF COMMON MACHINES

MACHINE	SPEEDS IN R.P.M.
Fanning mill shaker	280
Viking corrugated rolls	50
Carter disc rotor	58-60
Wire grader	50
Indent cylinder	56
Gravity deck speed	350-400

TABLE 7 — RATED CAPACITIES OF COMMON SEED CLEANING UNITS
FOR SEED GRADES

UNIT	APPROXIMATE CAPACITY IN BUSHELS PER HOUR
Bulldog Fanning Mill:	
24 inches	20
32 inches	35
40 inches	50
Viking Fanning Mill:	
24 inches	20
32 inches	35
40 inches	50
Winner Fanning Mill (several sizes)	30-90
Standard Fanning Mill	30-50
Calkins Fanning Mill	50-75; 75-120
Bodie "Airway"	30-50
Forever Fanning Mills:	
Special	15-25
Standard	35-60
Dustless	50-70
Clipper Fanning Mills (several sizes)	25-200
Crippen: sizes to	2,000
Link "Aero"	20-40
Carter Disc:	
Farm	20-75
Commercial to	2,000
Indent Cylinders: several sizes to	200
Freeman	50
Beattie Blanket Cleaner	15-30
Oliver Gravity Cleaner	70
Forsberg Gravity Cleaner	30

PARTIAL LIST OF GRAIN CLEANING MACHINES AND ACCESSORIES

1. Fanning Mills

- (a) *Bulldog*: *Capacity*
 24 inches.....20 bushels per hour
 32 inches.....35 bushels per hour
 40 inches.....50 bushels per hour
 Distributed by Hart-Emerson Co. Ltd., Box 488, Winnipeg, Manitoba.
- (b) *Viking*:
 24 inches.....20 bushels per hour
 32 inches.....35 bushels per hour
 40 inches.....50 bushels per hour
 Distributed by Hart-Emerson Co. Ltd., Box 488, Winnipeg, Manitoba.
- (c) *Winner*.....24 inches to 48 inches wide
 Distributed by Cancade Bros., 12th & Richmond, Brandon, Manitoba.
- (d) *Standard*.....24 inches, 28 inches, 32 inches, 40 inches and 48 inches
 Manufactured by Standard Fanning Mill Co., Huron & Essex St. S.E., Minneapolis 14, Minn.
 Distributed by D. N. Jamieson & Son, Ltd., 391-3 Erin St., Winnipeg, Manitoba.
- (e) *Calkins*—cleaner, grader, treater:
 Model C101D.....75-120 bushels per hour
 Model C91D.....50-75 bushels per hour
 Calkins Manufacturing Co., N. 1102 Atlantic St., Spokane, Washington.
- (f) *Bodie "Airway"*.....30-50 bushels per hour
 Farm Equipment and Seed Co., 284 William Ave., Winnipeg, Manitoba.

2. Vertical Air Blast Cleaners

- (a) *Forever*:
 Special 24 inches and 30 inches.....15-25 bushels per hour
 Standard 30 inches, 36 inches, 42 inches.....35-60 bushels per hour
 Dustless 36 inches, 42 inches.....50-70 bushels per hour
 Forever Industries Ltd., 115 Robinson St., Winnipeg, Manitoba.
- (b) *Clipper*:
 Model M2B.....30 bushels per hour maximum
 Model 27.....125 bushels per hour maximum
 Super 29D.....100-150 bushels per hour
 Super 298D.....125-200 bushels per hour
 Super 2969D.....100-150 bushels per hour
 Super 2968D.....125-200 bushels per hour
 Super 60 series.....50-200 bushels per hour
 Super 40 series.....50-100 bushels per hour
 (other models and mills for special crops available)
 Manufactured by A. T. Ferrell & Co., Saginaw, Michigan.
 Farm models distributed by C. C. King & Co. Ltd., 1485 Erin St., Winnipeg, Manitoba.
- (c) *Crippen*:
 Model G42.....300 bushels per hour
 Model G54.....500 bushels per hour
 Model F54.....400-500 bushels per hour
 Model M5472.....500-1,000 bushels per hour
 Model M4272.....400-800 bushels per hour
 Model H434A.....250 bushels per hour
 Model H442.....350 bushels per hour
 (other models also available)
 Portable GS54.....150 bushels per hour
 Manufactured by Crippen Manufacturing Co., Alma, Michigan.
- (d) *Link Aero*.....20-40 bushels per hour
 Manufactured by Link Manufacturing Co., Fargo, N.Dakota.
 Distributed by McKenzie Auto Equipment, Regina, Sask.

3. Indent Cylinders and Discs

- (a) *Carter Disc:*
Model 1518—single rotor.....20-25 bushels per hour
Model 1518b—single rotor.....50-75 bushels per hour
Model 1539—double rotor.....50-75 bushels per hour
Model 2131
Model 2532
Model 2564.
 Sizes from three bushels per hour to 2,000 bushels per hour
 Manufactured by Hart-Carter Co., 655-19th St. E., Minneapolis 18, Minn.
 Distributed by Strong Scott Co., Winnipeg, and Hart-Emerson Co., Winnipeg.
- (b) *Hart Uniflow:*
No. 11, 30, 32, 33, 44, 45.....capacities up to 200 bushels per hour
Distributed by Hart-Emerson Co., Winnipeg.
- (c) *Hart Indent*.....No. 2
Distributed by Hart-Emerson Co., Winnipeg.
- (d) *Freeman:*
Free Man Junior (grooved cylinder) 1 cylinder.....50-70 bushels per hour
Manufactured by Freeman Manufacturing Co., 3648 Burnslund Road, Calgary.

4. Graders

- (a) *Carter Precision Graders:*
Models 511, 521, 532, 1-BC....grading by width using slotted cylinders
Distributed by Strong Scott Co., Winnipeg, Man.
- (b) *Hart Uniflow Width Grader:*
Distributed by Hart-Emerson Co., Winnipeg, Man.
- (c) *Leach Seed Grader*.....several models and capacities
Distributed by Leach Brothers Manufacturing Co., Brownwood, Texas, U.S.A.

5. Blanket Type Cleaners

- (a) *Beattie Blanket Cleaner:*
Combination sieve and blanket cleaner 25-50 bushels per hour
Distributed by Cancade Bros., Ltd., 12th and Richmond, Brandon.
- (b) *Phillips Blanket Cleaner:*
Distributed by Cancade Bros., Ltd., Brandon.

6. Gravity Separators

- (a) *Forsberg Farm Size Gravity Separator*.....up to 30 bushels per hour
Forsberg Vacuum Gravity Separator.....Commercial
Manufactured by Fred Forsberg & Sons, Inc., Thief River Falls, Minn.
- (b) *Specific Gravity Separator*.....Models Sy200, Sy300
Distributed by Kipp-Kelly Ltd., 68 Higgins Ave., Winnipeg, Man.
- (c) *Oliver "High-Cap" Gravity Separator*.....70 bushels alfalfa per hour
Manufactured by Oliver Manufacturing Co., Rocky Ford, Colorado, U.S.A.
Distributed by Strong Scott Co., Winnipeg, Man.

7. Moisture Testers

- (a) *Radson Moisture Meter*.....Farm
Manufactured by Radson Engineering Corporation, 639 Eldorado St., Decatur, Ill., U.S.A.
- (b) *CAE Halross Moisture Meter*.....Model 919
Manufactured by A. T. Ferrell & Co., Saginaw, Mich., U.S.A.
Distributed by Strong-Scott Co., Winnipeg, Man.
- (c) *Behlen Electronic Moisture Tester*.....Farm
Manufactured by Behlen Manufacturing Co., Columbus, Neb., U.S.A.

- (d) *Several Makes and Models:*
Manufactured by the Seedburo Equipment Co., 618-626 W Jackson Blvd., Chicago 6, Ill., U.S.A.
- (e) *Several Makes and Models:*
Manufactured by Burrows Equipment Co., 1316 Sherman Ave., Evanston, Ill.

8. Seed Treaters

- (a) *Forsberg Liquid Treater*.....500 bushels per hour
Manufactured by Fred Forsberg & Sons, Inc., Thief River Falls, Minn.
- (b) *Panogen Seed Treaters*.....up to 600 bushels per hour
Manufactured by Panogen Inc., Ringwood, Ill.
- (c) *Rocker Seed Treater*
Manufactured by A. T. Ferrell & Co., Saginaw, Mich.
- (d) *Kromer "Uniform Coat" Seed Treater*.....Dust
Manufactured by O. W. Kromer Co., Minneapolis 11, Minn.
- (e) *Link Seed Treater*.....50-150 bushels per hour
Manufactured by Link Manufacturing Co., Fargo, N.D.
Distributed by McKenzie Auto Equipment, Regina.
- (f) *Siren Standard Model*
Siren Auger Treater
Manufactured by Siren Manufacturing Co. Ltd., 3436-15th St., S.E., Calgary, Alta.
- (g) *Slurry or Dust Type Attached to Cleaner Grader:*
Manufactured by Calkins Manufacturing Co., 1102 Atlantic St., Spokane, Wash., U.S.A.
- (h) *Slurry, Dust and Liquid Types:*
Manufactured by Ben Gustafson & Son Manufacturing Co., 1031 Centre Ave., Moorhead, Minn.
- (i) *Mechanical Seed Treater:*
Model SC.....auger mounted dust type
Manufactured by J. R. Leach and Son Ltd., Prince Albert, Sask.

9. Accessories

- (a) *Robinson "Pneu-spout" System*.....aluminum
Robinson of Rochdale, England, Line of Cleaners and Equipment:
Air Flotation Stoner.....removes stones, glass, metal, nails
Eddy Roller Mill:
Clover and Alfalfa.....300-600 pounds per hour
Distributed by Kipp-Kelly Limited, 68 Higgins Ave., Winnipeg, Man.
- (b) *Legs, Elevators, etc.:*
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- (e) *Testing, Grading and Handling Equipment:*
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- (f) *Cups, Manlifts, Electric Truck Lifts, O'Haus Testing Scales:*
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